

Research Article

Blackgram KKM 1 (KKB 05011), a rice fallow variety suited for Thamirabarani tracks of Tamil Nadu

M. Arumugam Pillai, N. Shunmugavalli, B. Selvi, A. Muthuswamy, G. Anand, R. Pushpam D. Shoba, S. Saravanan, Asish K. Binodh and R. Kannan

Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Killikulam 628 252

E-mail: sarapbg@gmail.com

(Received: 28 July 2017; Revised: 30 Aug 2017; Accepted: 01 Sep 2017)

Abstract

A high yielding blackgram variety KKM 1 (KKB 05011 culture) is a cross derivative of COBG 653 x VBN 3 and matures in 65-70 days. This culture recorded a mean grain yield of 645 and 570 Kg/ha in station trials which is 16.2 and 12.4 per cent increased yield over check variety ADT 3 under irrigated and rice fallow condition respectively. It has bold seeds with a mean 100 seed weight of 4.47 grams. It is determinate and has synchronized maturity. The protein content of KKB 05011 is 20.8 per cent and has good batter qualities like high initial batter volume and volume after fermentation. The blackgram KKB 05011 culture is moderately resistant to Yellow mosaic virus, Powdery mildew and Pod borer but resistant to root knot nematode (*Meloidogyne javanica*). The blackgram KKB 05011 was released as TNAU blackgram KKM 1 in the year 2017 for large scale cultivation in Tamil Nadu.

Key words

Rice fallow, Blackgram KKM 1

Introduction

Blackgram (*Vigna mungo* (L.) Hepper) is an important legume crop of South-east Asia. It is an erect or spreading annual mostly grown as a pulse crop for its protein (20.8 to 30.5 per cent) with total carbohydrates ranging from 56.5 to 63.7 per cent. It is also a good source of phosphoric acid and calcium. It contains a wide variety of nutrients and is popular for its fermenting action and thus it is largely used in making fermented foods. Despite India being the largest producer and processor of pulses in the world also imports around 3.5 million tons annually on an average to meet its ever increasing consumption needs of around 22.0 million tons. India's population is expected to touch 1.68 billion by 2030 and the pulse requirement for the year 2030 is projected at 32 million tons with anticipated required annual growth rate of 4.2%. (Anonymous, 2015). Blackgram, cultivated as a sole crop and intercrop is the third important pulse crop in India, covering an area of about 3.24 million hectares and producing 1.46 million tonnes. Productivity is only 526 Kg/ha. In Tamil Nadu, blackgram covers an area of about 3.06 lakh hectares with production of 1.70 million tonnes and productivity of 555 kg/ha (Anonymous, 2016). However, its yield is low compared to other grain legumes. In view of declining production of pulse crops, there is a dire need to develop high yielding cultivars through modern crop breeding tools. Plant breeders always give constant efforts for development of better varieties in crops to face and adopt the present crop situations besides enhancing yield strata and to narrow the yield gap for further increase in grain productivity.

Materials and Methods

The blackgram culture KKB 05011 was evolved at Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Killikulam. It is the cross between two popular and versatile varieties, COBG 643 and VBN 3. Elite plants with desirable characters which contribute towards high grain yield were selected from F₂ generation onwards. They were evaluated for their sustained performance, homozygosity and the culture KKB 05011 was identified as the best. It was evaluated with check varieties in Multi location trial (MLT), Adaptive research trial (ART), On Farm Trial (OFT), AICRP trials viz., Initial varietal trial (IVT), Advanced varietal trial (AVT) and in on farm trials. Thus, a total of 161 trials were conducted. Besides, the reaction of the culture against important pests and diseases was studied. Based on the standard procedure the grain quality and its consumer acceptability were also analyzed.

Results and Discussion

Performance of Blackgram KKM 1 (KKB 05011 culture) over different trials: Blackgram KKM 1 (KKB 05011 culture) recorded a mean grain yield of 645 and 570 Kg/ha in station trials which is 16.2 and 12.4 per cent increased yield over check variety ADT 3 under irrigated and rice fallow situations respectively. In multilocation trial conducted at various research station KKB 05011 recorded 748 Kg/ha which is 10.5, 19.3 per cent increased yield over check variety VBN 5 (677 Kg/ha) and CO (Bg) 6 (627 Kg/ha).

A total of 127 on farm research trials has been conducted and the culture KKB 05011 has recorded an average yield of 602 Kg/ha which is 13.30 per cent increased yield over the check

ADT 3 (531 Kg/ha). In Trichy district, KKB 05011 recorded 23.11 per cent increased yield over ADT 3 (649 Kg/ha) followed by 20.2 per cent increased yield over ADT 3 in Kanyakumari district. Under rice fallow condition, 88 on farm trials were conducted in southern districts of Tamil Nadu and an average yield of 544 Kg/ha was recorded by KKB 05011 blackgram culture which is 11.02 per cent increased yield over the check ADT 3 (490 Kg/ha).

In the national trial (South zone) the culture KKB 05011 recorded 730 Kg/ha which is 4.4 and 5.0 per cent increased yield over Pant U30 (699 Kg/ha) and TU 94-2 (695 Kg/ha) respectively. Further, the culture KKB 05011 managed to give an exorbitant yield of 957 Kg/ha in northern hilly zone compared to the national check Uttra (807 Kg/ha) and Pant U 31 (794 Kg /ha). Also, under central zone trial the culture ranked second (984 kg/ha) next to AKU 10-1(985 Kg/ha) and out yielded the check variety KU 96-3 (834 Kg/ha) and NUL 7 (974 Kg/ha). (Table 1)

Assessment of Seedling vigour in Blackgram KKB 05011 culture under rice fallow condition: Rice fallow pulses are grown by utilizing the residual moisture and also the moisture from dew late in the season. The seedling vigour of rice fallow black gram is one of the reasons for increasing yield under rice fallow condition. The culture KKB 05011 recorded highest seedling vigour index of 4008 compared to ADT 3 (3787). (Table 2)

Reaction to pests and diseases: The culture KKB 05011 was evaluated for pod borer and root knot nematode besides YMV and powdery mildew diseases. It is moderately resistant to Yellow mosaic virus, Powdery mildew and Pod borer but resistant to root knot nematode (*Meloidogyne javanica*). Table 3a to 3f

Grain Quality: Blackgram is mainly used to make fermented dishes. This culture has good batter characteristics with high initial batter volume and batter volume after fermentation (Table 4a to 4c). It has good organoleptic traits. It is nutritionally rich with high protein content of 20.8 per cent with dull black coloured seeds and 6.7 per cent arabinose content compared to ADT 3 (6.2 %).

Morphological characters: The blackgram culture KKB 05011 matures in 65– 70 days. It has erect and determinate growth habit with a plant height ranging from 45-60 cm. Pods are light hairy with length ranging from 5 to 7 cm. The seeds are black, drum shaped, dull black with a 100 seed weight ranging from 4.47 grams (Table 5). This culture KKB 05011 is having superior features viz., high yield, short duration, synchronized maturity, non shattering of pods, bold seeds, good batter

qualities and moderately resistant to important pests and diseases.

The blackgram KKB 05011 culture was released as TNAU blackgram KKM 1 in the year 2017 for large scale cultivation in Thamirabarani tracks of Tamil Nadu.

References

- Anonymous, 2014, Pulses in India Retrospect & Prospects, Ministry of Agriculture and Farmers welfare, Directorate of Pulses Development, 1-81.
Anonymous, 2016. Vision 2050, IIPR Vision document, 1-36

Table 1. Overall performance of black gram culture KKB 05011 in various trials

Sl. No	Trials	No. of Trials	Yield (Kg/ha)				
			KKB 05011	VBN 4	TNAU (Bg) CO6	ADT 3	VBN5
1	AC&RI, Killikulam Rice Fallow (2008-12)**	5	570	-	-	507	494
2	AC&RI, Killikulam Irrigated (2007-09)	4	645	590	-	555	-
3	Multilocation Trials (2010-11)	5	748	-	627	-	677
4.	All India Co-ordinated Trials (2010-11)*	20	890	-	-	-	-
5.	On Farm Trial (2012-16)**	127	602	-	-	531	-
Total Number of Trials			161	4	5	136	10
Overall weighted Mean Yield in Kg/ ha			607	590	627	530	585
Percentage increase over the checks				2.7	-	14.5	3.6

*Checks for All India Coordinated Trials are Pant U 30, Pant U 31, Uttara, KU 96-3, TU 94-2, NUL 7 and the data were not included in the calculation of the weighted mean.

**Trials conducted under rice fallow condition.

Under rice fallow condition, out of 132 trials (Station trials & On Farm Trials), KKB 05011 recorded 600 kg/ha which is 13.2 per cent increased yield over ADT 3 (530 Kg/ha).

Table 2. Seedling vigour index of KKB 05011

Variety	Germination Percentage	Vigour Index
KKB 05011	93	4008
ADT 3	93	3787
VBN 4	94	4350

Table 3a. Reaction of Black gram culture KKB 05011 against Yellow Mosaic Virus disease at NPRC, Vamban

Sl. No	Season & Year	KKB 05011	Vamban 5	TNAU (Bg) CO 6	CO 5
1.	Kharif 2010	3	3	3	9
2.	Rabi 2010 -11	No Incidence of YMV	No Incidence of YMV	No Incidence of YMV	No Incidence of YMV

Yellow Mosaic Virus Disease (Scale)

0 – Immune 1 – Resistant 3 - Moderately resistant 5 - Moderately susceptible 7 – Susceptible 9 - Highly susceptible

Table 3b. Reaction of Black gram culture KKB 05011 to Yellow mosaic virus at AC&RI, Killikulam

Sl.No	Season & Year	YMV score				Remarks
		KKB 05011		ADT 3		
		Mean YMV	Mean YMV	Mean YMV	Mean YMV	
		Grade 30 DAS	Grade 45 DAS	Grade 30 DAS	Grade 45 DAS	
1	Kharif 2011	2.25	2.80	2.80	3.00	Moderately resistant
2	Rice fallow 2011-12	1.00	2.00	2.00	3.00	Moderately resistant



Table 3c. Reaction of Black gram culture KKB 05011 against Powdery Mildew Disease at NPRC,Vamban

Sl. No	Season & Year	KKB 05011	Vamban 5	TNAU (Bg) CO 6
1.	Rabi 2010 -11	3	3	3
Powdery Mildew Disease (Scale) : 1 - Resistant 3 - Moderately resistant 5 - Moderately susceptible 7 - Susceptible 9 - Highly susceptible				

Table 3d. Reaction of Black gram culture KKB 05011 against Leaf Crinkle Virus (LCV) at NPRC, Vamban

Sl. No	Season & Year	KKB 05011	Vamban 5	TNAU (Bg) CO 6
1.	Kharif and Rabi 2010 -2011	No incidence of LCV	No incidence of LCV	No incidence of LCV

Table 3e. Reaction of Black gram culture KKB 05011 to pod borer at NPRC, Vamban

Year	Cumulative pod borer damage %	
	KKB 05011	Pant U 19 (National check)
Kharif 2010	12.5	12.5
Rabi 2010	11.5	16.0

Table 3f. Reaction of Black gram culture KKB 05011 to Pod borer at AC&RI, Killikulam

Sample	Percentage of damage
KKB 05011	8.40
ADT 3	9.00

Table 4a. Organoleptic Characteristics

Variety	Particulars	Colour & appearance	Flavour	Texture	Taste	Over all acceptability
KKB 05011	Vadai	9.0	8.5	8.5	9.0	9.0
	Dosai	9.0	8.5	8.5	9.0	9.0
	Millet dosai	9.0	9.0	8.5	9.0	9.0
ADT 3	Vadai	9.0	9.0	9.0	9.0	9.0
	Dosai	9.0	9.0	9.0	9.0	9.0
	Millet dosai	9.0	8.5	8.5	9.0	9.0

Table 4b. Physical Characteristics of Black gram dhal

Sample	Length (cm)	Breadth (cm)	100 grain weight (g)
KKB 05011	0.48	0.37	4.47
ADT 3	0.47	0.38	4.22
VBN (Bg)4	0.48	0.38	4.81

Table 4c. Protein, Arabinose Globulin content and batter volume of black gram cultures

Sample	Protein content (%)	Arabinose content (%)	Globulin content (%)	Batter volume after fermentation (ml)
KKB 05011	20.8	6.7	13.11	400
VBN 3	20.5	5.2	11.61	380
ADT 3	20.0	6.2	13.07	340
VBN (Bg) 4	20.2	5.5	12.94	-
MDU 1	21.8	7.05	12.10	-

Table 5. Morphological characteristics of Black gram culture KKB 05011

S.No	Characteristics	Details
1.	Hypocotyl: Anthocyanin colouration	Absent
2.	Time of flowering	Early - 34 days
3.	Plant: Growth habit	Semi erect – 49 cm
4.	Plant: Habit	Determinate
5.	Stem: Colour	Purple with green splashes
6.	Stem: Pubescence	Present
7.	Leaflet (Terminal): Shape	Ovate
8.	Foliage: Colour	Green
9.	Leaf: Vein colour	Green
10.	Leaf: Pubescence	Absent
11.	Petiole: Colour	Green with purple splashes
12.	Pod: Intensity of green colour of premature pods	Green
13.	Pod: Pubescence	Light-hairiness
14.	Peduncle: Length	Long (>10 cm) : 10 – 12 cm
15.	Pod: Length	Medium (5 – 7 cm) : 5 cm
16.	Pod: Colour of mature pod	Brownish Black
17.	Plant Height	Medium (45 – 60 cm) : 49 cm
18.	Seed: Colour	Black
19.	Seed: Lusture	Dull
20.	Seed: Shape	Drum shaped
21.	Seed: Size (Weight of 100 seeds)	4.47 g

Genealogy/Pedigree Chart of KKB 05011



